THIS IS A LEGACY SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

HUMAN BIOLOGY

2856

Blood, Circulation and Gaseous Exchange

CUP/T72540

Candidates answer on the question paper

OCR Supplied Materials:
None

Other Materials Required:
- Electronic calculator
- Ruler (cm/mm)

Thursday 8 January 2009
Morning

Duration: 1 hour

2856

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**14**	
2	**9**	
3	**8**	
4	**9**	
5	**8**	
6	**12**	
TOTAL	**60**	

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Answer **all** the questions.

1 In the UK, the National Blood Service (Blood Transfusion Service) collects and stores blood and blood products.

(a) Describe how a blood sample is taken.

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..... **[3]**

(b) Blood may be stored as whole blood, or may be stored as blood products such as plasma and serum.

Complete Table 1.1 to indicate whether the components shown are present in whole blood, plasma or serum.

Use a tick (✓) to indicate that the component is present or a cross (✗) to indicate that it is absent.

Table 1.1

	components		
	erythrocytes	macrophages	prothrombin and fibrinogen
whole blood			
plasma			
serum			

[3]

(c) The blood product known as 'packed red cells' is often used for transfusions.

Packed red cells are erythrocytes that have been separated from plasma and stored in an isotonic solution.

(i) Suggest **one** reason why a person may need to be given a transfusion of packed red cells.

..... **[1]**

(ii) Explain, in terms of water potential, why it is not possible to store packed red cells in distilled water.

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..... **[4]**

(d) In the body, many substances are exchanged between the blood in the capillaries and the surrounding body tissues.

List **three structural** features of capillaries that aid the exchange of substances between blood and the surrounding body tissues.

1. .....

2. .....

3. ..... **[3]**

[Total: 14]

2 Fig. 2.1 shows diagrams of different cells labelled **A** to **F**. The diagrams are **not** drawn to scale.

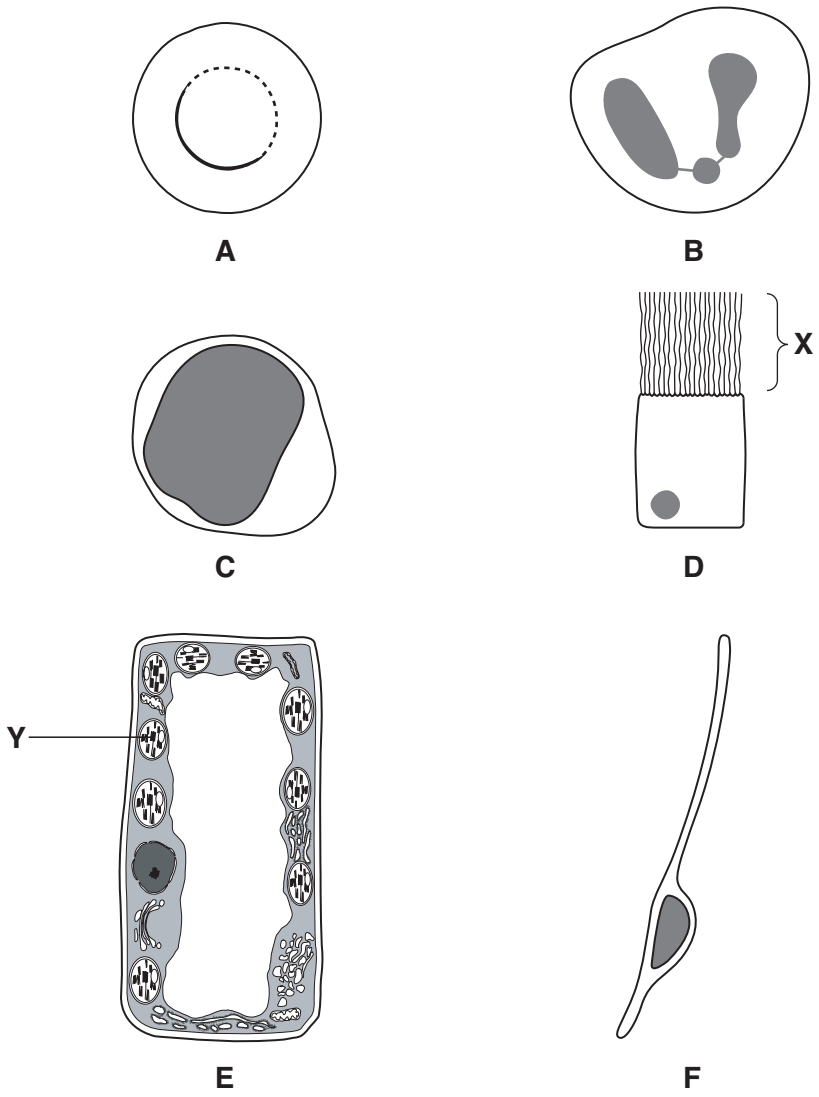

Fig. 2.1

(a) (i) Name the type of cell labelled **B**, **C** and **F**.

B .....

C .....

F ..... **[3]**

(ii) Identify **X** and **Y**.

X .....

Y ..... **[2]**

(b) Cell **A** has a large surface area to volume ratio. This means it can achieve a maximum rate of diffusion.

Describe the **structural** features of cell **A** that help it to carry out its function.

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..... **[2]**

(c) Table 2.1 shows the dimensions of cell **A** and cell **F**.

Table 2.1

cell	mean thickness / μm	surface area / μm^2	volume / μm^3
A	1.5	140	105
F	0.4	12 000	1 800

The surface area to volume ratio for cell **A** was calculated as 1.33 to 1. This ratio can also be expressed as 1.33 : 1.

Calculate the surface area to volume ratio for cell **F**.

Show your working.

Answer = ... **[2]**

[Total: 9]

3 Haemoglobin is a protein molecule.

Complete the following passage about haemoglobin by using appropriate words from the list to fill the gaps. **The words may be used once, more than once or not at all.**

amino acid	**calcium**	**condensation**	**eight**
fibrous	**four**	**globular**	**hydrolysis**
iron	**monosaccharide**	**primary**	**quaternary**
secondary	**tertiary**	**three**	**two**

Haemoglobin is a large complex ..... protein molecule made from ..... monomers. These monomers are joined together by ..... reactions.

Each haemoglobin molecule has ..... separate polypeptide chains, which bond together to form the ..... structure of the protein. The polypeptide chains that make up haemoglobin are alpha chains and beta chains. These chains differ from each other in their sequence of amino acids, which is their ..... structure.

The function of haemoglobin is to transport oxygen. It is able to do this because, in addition to polypeptide chains, haemoglobin also contains haem groups. The presence of haem groups allows each molecule of haemoglobin to carry up to ..... molecules of oxygen. The oxygen molecules are carried bound to the ..... atoms within haem groups.

[Total: 8]

4 In this question, one mark is available for the quality of use and organisation of scientific terms.

Cigarette smoke contains over 4 000 different chemical components. Many of these are harmful to health and can cause a number of different conditions.

Describe the effects of **long term** exposure to cigarette smoke on the respiratory system.

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Quality of Written Communication **[1]**

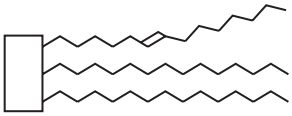
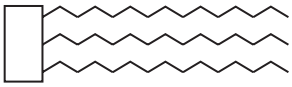
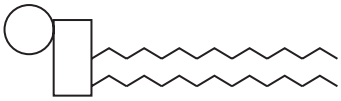
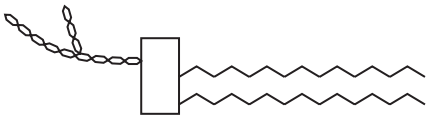
[Total: 9]

5 Lipid and lipid-based molecules have many functions in the human body. They can act as energy storage molecules, as structural components of membranes or as hormones.

(a) Table 5.1 shows diagrams of a range of lipid and lipid-based molecules with different structures.

(i) Complete Table 5.1 by identifying each type of molecule. The first one has been done for you.

Table 5.1

	diagram of molecule	type of molecule
P		unsaturated triglyceride
Q		.....
R		.....
S		.....

[3]

(ii) Explain why molecule **P** differs in shape from molecule **Q**.

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..... **[2]**

(b) High blood lipid concentration is one risk factor associated with coronary heart disease (CHD). Lipid and lipid-based molecules are transported mainly in the blood in the form of lipoproteins.

Low density lipoproteins (LDL) and high density lipoproteins (HDL) are two categories of lipoprotein.

Explain why blood concentrations of LDL **and** HDL are measured to assess the risk of CHD.

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..... **[3]**

[Total: 8]

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6 Glycogen is a polysaccharide that is stored in the tissues of the liver.

(a) Name **one** tissue in the body, **other than** the liver, that can store glycogen.

..... **[1]**

The formation of glycogen from glucose inside cells is a process that involves the formation of an intermediate compound.

Fig. 6.1 outlines the formation of glycogen in liver cells.

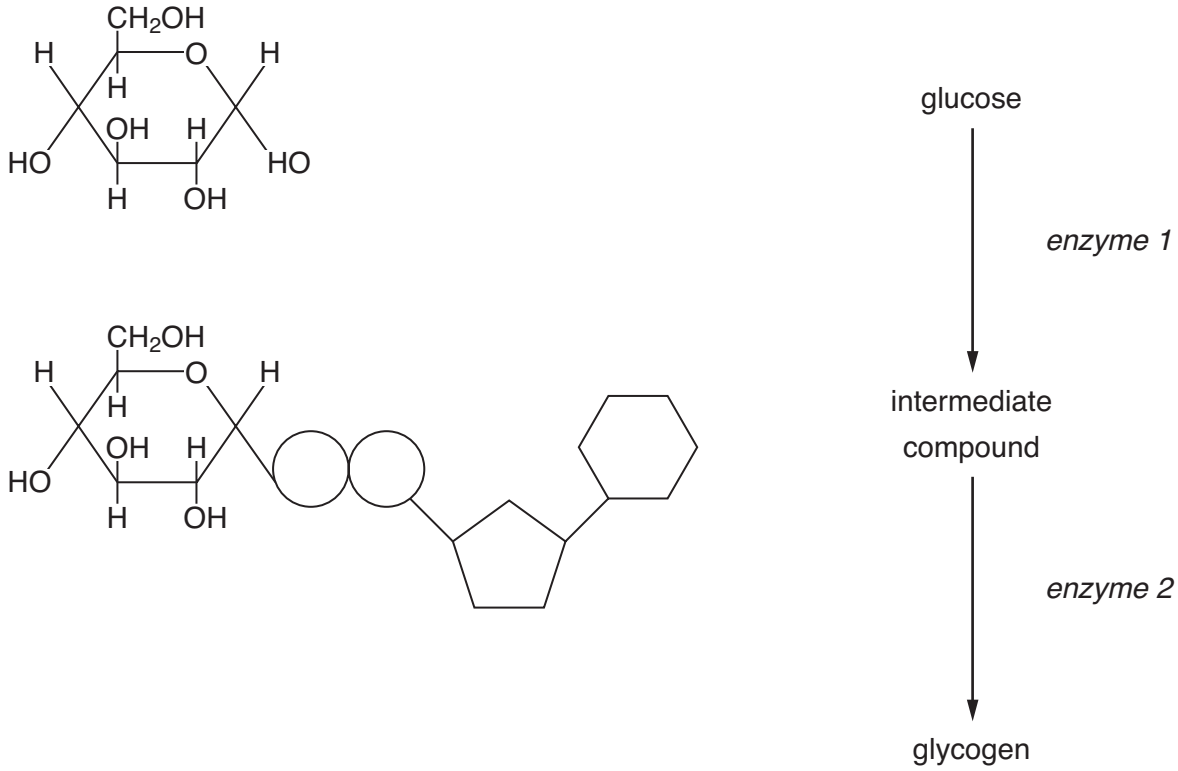

Fig. 6.1

(b) Suggest why enzyme 2 can use the intermediate compound as a substrate but cannot use glucose as a substrate. Credit will be given for using information from Fig. 6.1 in your answer.

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..... **[4]**

(c) Fig. 6.2 shows the results of an investigation to determine how changing the concentration of the intermediate compound affects the rate of glycogen formation. All other variables were kept constant.

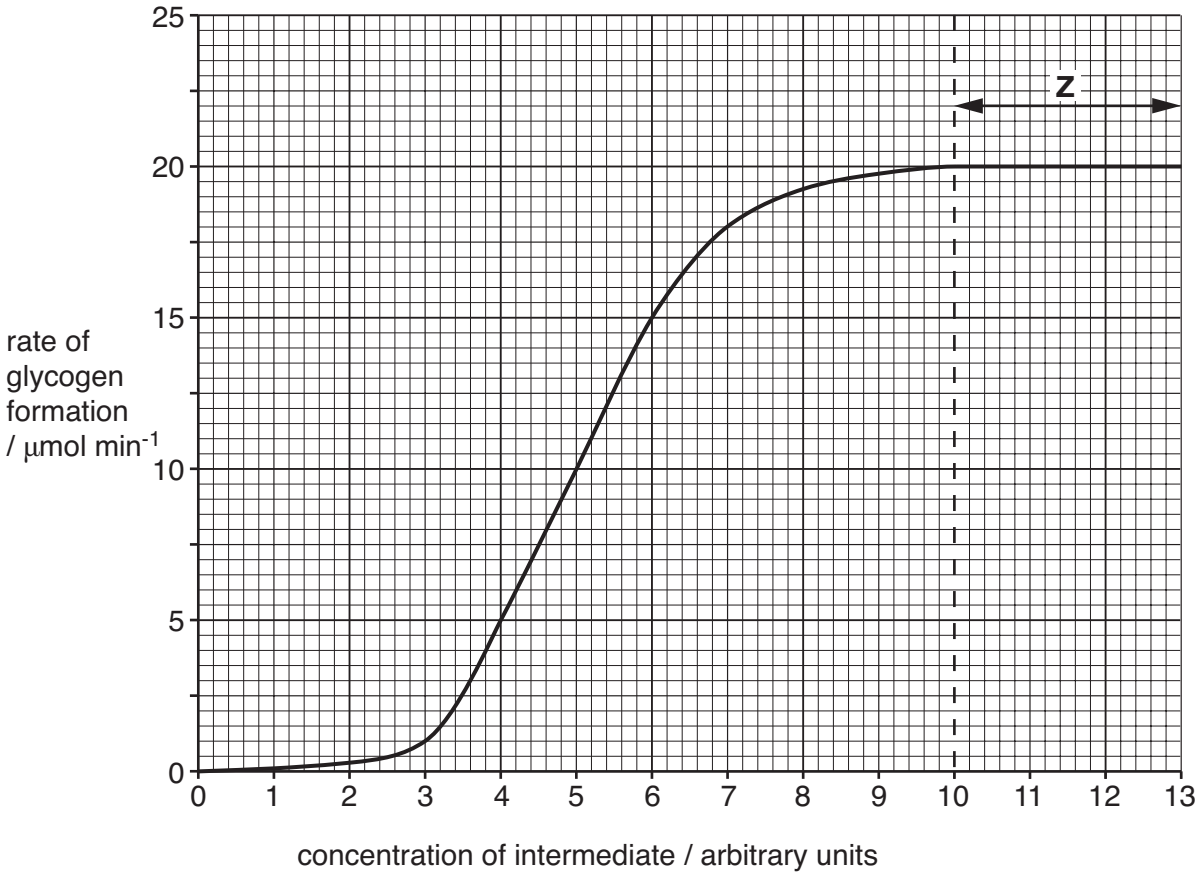

Fig. 6.2

(i) Using Fig. 6.2, describe the effect on the rate of glycogen formation of increasing the concentration of the intermediate from 0 to 10 arbitrary units.

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..... **[3]**

(ii) Explain why the rate of glycogen formation remained constant in the region labelled **Z** in Fig. 6.2.

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..... **[2]**

(d) Glucose molecules that are used to form glycogen in liver cells enter these cells by facilitated diffusion.

It is important that glucose is converted to the intermediate compound quickly inside liver cells to ensure that glucose continues to enter the cells at a suitable rate.

Explain why.

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..... **[2]**

[Total: 12]

END OF QUESTION PAPER

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